

UV-VIS. Spectra

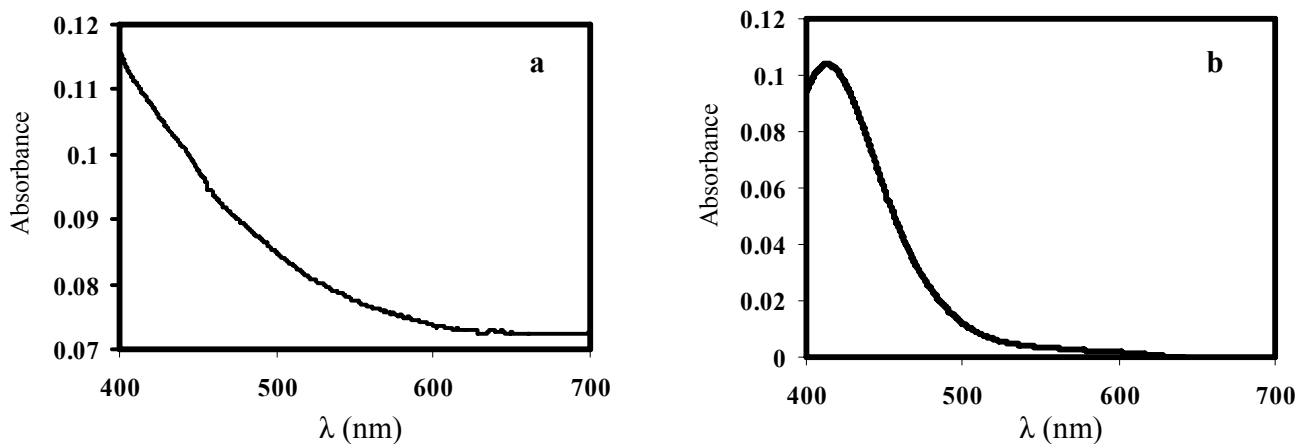


Figure 1S a) Absorbance spectra of Pd nanoparticles on the surface of a glass slide, b) Absorbance spectra for Pd (II) solution.

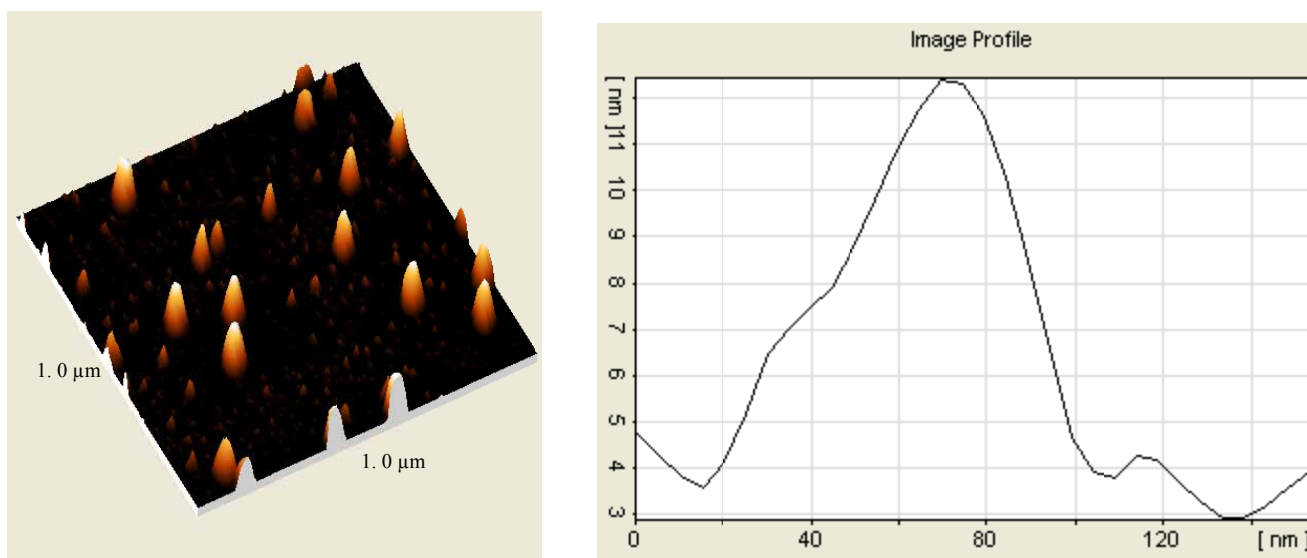


Figure 2S. AFM image and image profile of palladium nanoparticles immobilized on xerogel and supported on glass slide.

Table 1S: Recovery and Recycling of Pd Nanoparticles for Suzuki Reaction of Bromobenzene with Phenylboronic Acid.^a

	Run 1	Run 2	Run 3	Run 4	Run 5
Yield (%) ^b	95	93	97	90	92

^a Reaction time 9 h; ^b Isolated yield

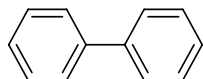
Experimental:

Typical procedure for the Heck reaction of bromobenzene and styrene: Bromobenzene (1mmole, 0.105 ml) and styrene (1.2 mmole, 0.13 ml) were added to a flask containing of IL-modified glass surface treated with Pd NPs in refluxing ethanol. Then K_2CO_3 (1.5 mmole, 0.207 g) was added to the mixture. GC and TLC analysis of the reaction mixture showed the completion of the reaction after 15 h. After completion of reaction, ethanol was evaporated and water (4 ml) was added to the reaction mixture and the product was extracted with diethyl ether (3×5 ml). Evaporation of the solvent followed by chromatography on a short column of silica gel gave *trans*-stilbene (0.169 g, 95%).

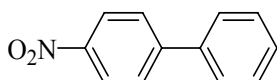
Typical procedure for the Suzuki reaction of bromobenzene and phenylboronic acid: K_2CO_3 (1.5 mmole, 0.207 g) was added to a flask containing of IL-modified glass surface treated with Pd NPs, bromobenzene (1mmole, 0.105 ml) and phenylboronic acid (1.2 mmole, 0.14 g) in refluxing ethanol. GC and TLC of the reaction mixture showed the completion of the reaction after 9 h. After completion of reaction, ethanol was evaporated and 4 ml of water was added to the reaction mixture and then biphenyl was extracted with diethyl ether (3×5 ml). Evaporation of the solvent followed by chromatography on a short column of silica gel gave biphenyl (0.146 g, 95%).

Typical Procedure for Chemiluminescence reaction: For study of the effect of Pd nanoparticles on chemiluminescence reactions, between H_2O_2 and lumigen, two different glass slides were used. One of the glass slides was coated with Pd nanoparticles supported on xerogel, while the other was coated with only xerogel. 15 μ l of Lumigen solution was injected on each slide and then 20 μ l of H_2O_2 solution was injected. The intensity of emission was measured after 10 s by CCD.

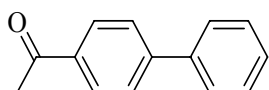
^1H - and ^{13}C -NMR spectral data of the products:



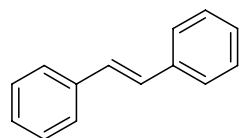
^1H -NMR (250 MHz, CDCl_3): 7.63–7.31 (m, 10 H) ppm; ^{13}C -NMR (60 MHz, CDCl_3): 145.5, 130.3, 127.4, 127.2 ppm.



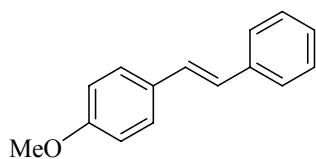
^1H -NMR (250 MHz, CDCl_3) 8.29 (d, 2H, $J = 8.5$ Hz), 7.73 (d, 2H, $J = 8.5$ Hz), 7.63 (d, 2H, $J = 7.6$ Hz), 7.52-7.44 (m, 3H) ppm; ^{13}C -NMR (60 MHz, CDCl_3) 147.6, 147.0, 138.7, 129.1, 128.9, 127.8, 127.3, 124.1 ppm.



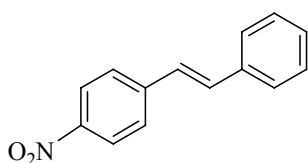
^1H -NMR (250 MHz, CDCl_3) 8.03 (d, 2H, $J = 8.6$ Hz), 7.71-7.62 (m, 4H), 7.50-7.40 (m, 3H), 2.64 (s, 3H) ppm; ^{13}C -NMR (60 MHz, CDCl_3) 197.5, 145.7, 139.8, 135.9, 128.9, 128.8, 128.2, 127.2, 127.1, 26.5 ppm.



^1H -NMR (250 MHz, CDCl_3) 7.53 (d, 4H, $J = 7.5$ Hz), 7.45 (t, 4H, $J = 7.5$ Hz), 7.35 (t, 2H, $J = 7.5$ Hz), 7.26 (s, 2H), ^{13}C -NMR (60 MHz, CDCl_3) 139.5, 130.5, 128.5, 126.7, 128.5.



$^1\text{H-NMR}$ (250 MHz, CDCl_3) 7.42 (d, 2H, $J = 7.5$ Hz), 7.37 (d, 2H, $J = 8.5$ Hz), 7.28 (t, 2H, $J = 7.5$ Hz), 7.18 (t, 1H, $J = 6.5$ Hz), 6.99 (d, 1H, $J = 16.0$ Hz), 6.89 (d, 1H, $J = 16.5$ Hz), 6.80 (d, 2H, $J = 8.5$ Hz), 3.77 (s, 3H); $^{13}\text{C-NMR}$ (60 MHz, CDCl_3) 160.5, 138.8, 130.9, 129.5, 128.0, 127.5, 127.0, 126.5, 126.0, 116.5, 57.5.



$^1\text{H-NMR}$ (250 MHz, CDCl_3) 8.40 (d, 2H, $J = 9.3$ Hz), 7.80 (d, 2H, $J = 9.3$ Hz), 7.71 (d, 2H, $J = 7.3$ Hz), 7.45–7.55 (m, 3H), 7.37 (d, 1H, $J = 16$ Hz), 7.23 (d, 1H, $J = 16.5$ Hz); $^{13}\text{C-NMR}$ (60 MHz, CDCl_3) 152.2, 149.9, 140.5, 135.5, 130.1, 129.0, 128.5, 128.0, 127.0, 125.5.

Mechanism of the Heck Reaction Performed with Pd (0) nanoparticles

